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The role of the new ecological paradigm scale on the willingness to pay and willingness to wait for e-commerce deliveries

Tanguy Baiwir[a] and Sabine Limbourg[a] and Mario Cools [b,s,d]

[a]HEC-University of Liege (ULiege), Rue Louvrex 14, 4000 Liege (Belgium) [b]ULiege, Local Environment Management & Analysis (LEMA) [c]Hasselt University, Faculty of Business Economics (Belgium) [d]KULeuven Campus Brussels (Belgium)

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CONTACT S. Limbourg. Email:sabine.limbourg@uliege.be

Abstract

Amidst the rise of e-commerce, understanding the interplay between consumer behaviors and environmental considerations has become pivotal. This study examines how environmental awareness impacts e-commerce consumers' preferences for sustainable versus express delivery options. To contribute to the literature in this field, we investigate the behaviors of a sample of 299 e-commerce consumers, particularly in light of growing environmental concerns. Leveraging the New Ecological Paradigm Scale (NEPS), we compute an ecological score, offering a comprehensive insight into its influence on varied consumer decisions. Principal Component Analysis of the NEPS items reveals that the first four components account for nearly 50% of the variance, highlighting significant dimensions of environmental perspectives. Additionally, Cronbach's alpha analysis indicates that the NEPS scale is reliable and has good internal consistency, justifying the use of a summated scale to reflect overall ecological positioning. We then contrast two primary delivery types: sustainable and express. The key metrics under scrutiny include the willingness to wait and the willingness to pay for sustainable delivery and willingness to pay for express delivery. Our findings affirm that NEPS affects positively willingness to pay and willingness to wait for sustainable delivery and negatively WTP for express delivery.

Keywords: E-commerce, Sustainability, willingness to wait, willingness to pay, New Ecological Paradigm Scale

1. Introduction

E-commerce is the use of the Internet to carry out commercial transactions at both the national and international levels (Skare, Gavurova, and Rigelsky 2023). Today, e-commerce has become a key player in the global economy. Advances in e-commerce technologies have dramatically streamlined the purchasing process, rendering the acquisition, ordering, and delivery of products more efficient (Burt and Sparks 2003). The COVID-19 pandemic has further amplified the sector's relevance; online shopping has become indispensable for consumption amid social distancing and lockdown measures.

Consequently, global e-commerce sales have surged, with consumers increasingly opting to shop from the safety and convenience of their homes. For instance, Walmart's e-commerce division witnessed a staggering 74% increase (Bhatti et al. 2020).

In Belgium, the e-commerce landscape has similarly expanded. Business-to-consumer (B2C) online retailers nearly doubled from 2010 to 2022. 2020 and 2021 were exceptional years for entrepreneurship in this sector, with growth rates of 45% and 23%, respectively (Jacob 2022).

Later, researchers began to consider the various side effects of consumers' online ordering behavior. Indeed, freight transport is responsible for various environmental and societal impacts, commonly referred to as externalities, which have elicited increasing concern from the world's population (Demir et al. 2015). Such externalities encompass congestion, pollution, waste management and even insecurity. In addition, the increase in supply and the intensification of sectoral competition have led to a desire to develop fast delivery systems (Duan et al. 2019; Fan et al. 2017). This has given rise to the next-day delivery process, putting environmental aspects on the back burner by potentially leading to more journeys with lower fill rates, increased emissions of polluting gases, congestion and, ultimately, a higher risk of accidents (Bi et al. 2020; Sage 2017). As an illustrative point, current data indicate that approximately 20% of trucks circulating in Europe are empty, and the remaining vehicles achieve only an average fill rate of approximately 50%, as explained by Macharis (2021). Reducing these negative impacts has become one of the most critical challenges we face today (European Commission, Directorate-General for Mobility and Transport et al. 2020).

Existing literature, such as Royne, Levy, and Martinez (2011), interrogates the widely held perception that consumers are increasingly inclined toward eco-friendly behaviors. This study provides empirical evidence by analyzing factors influencing an individual's willingness to pay (WTP) for environmentally friendly products and notes demographic variations in WTP. Further, Prakash and Pathak (2017) underscores the significance of personal norms, attitudes, environmental concerns, and WTP in shaping purchase intentions toward eco-friendly packaging. Drawing from data in the Chinese context, Liu, Yang, and Xu (2017) elucidate that factors such as low-carbon awareness and income levels exhibit negligible influence on consumers' WTP for low-carbon products. In contrast, delivery speed, consumer patience, and satisfaction are salient determinants. Furthermore, Ignat and Chankov (2020) demonstrate that presenting last-mile deliveries' environmental and social repercussions can influence e-commerce

consumers, predisposing them to opt for more sustainable delivery methods. In this paper, we refer to sustainable delivery as deliveries that are environmentally-friendly deliveries designed to minimize greenhouse gas emissions. When considering sustainability as a key driver in last-mile delivery, the environmental dimension emerges as the most significant aspect of perceived sustainability. This environmental focus positively impacts attitudes toward delivery methods, such as home delivery and parcel lockers, reinforcing prior research on the favorable effects of environmental sustainability. It also complements studies that highlight environmental awareness as a crucial factor influencing purchasing decisions (Klein and Popp 2022).

To contribute to the literature in this field, this study aims to investigate e-commerce consumer behaviors in the context of environmental concerns. Despite the increasing use of the New Ecological Paradigm Scale (NEPS) to assess individuals' environmental sensitivity, its application in understanding consumer decision-making in e-commerce delivery choices remains under-explored. Specifically, there is a notable gap in linking consumers' ecological attitudes, as measured by NEPS, to their preferences for sustainable versus express delivery services. This research bridges that gap by examining how consumers' environmental sensitivities influence their willingness to wait (WTW) and willingness to pay (WTP) for these delivery options.

Focusing on consumers from Wallonia, the southern region of Belgium, this study uniquely combines behavioral measures (WTW and WTP) with an ecological worldview score derived from the NEPS. By employing the NEPS in this context, the study offers a novel approach to quantifying the role of environmental attitudes in e-commerce delivery decisions. This nuanced understanding provides actionable insights for various stakeholders, including policymakers, logistics providers, and e-commerce platforms, seeking to align delivery strategies with consumer expectations and sustainability goals.

This study addresses a significant gap in existing literature and exemplifies an innovative application of the NEPS framework. Through this approach, the research elucidates the complex interplay between environmental concerns and consumer behavior in the context of last-mile delivery choices, offering valuable insights into sustainable logistics practices.

This paper consists of Section 2, which describes the related background, and Section 3, which defines the methodology and describes the data and analyses carried out. Section 4 presents the results, followed by a discussion of their potential in decision-making about preferred delivery types. Finally, Section 6 concludes the article before discussing future research and limitations.

2. Literature review

In this section, we examine the existing literature on the dynamics of express delivery and its environmental implications and the emergence of eco-delivery practices in response to growing consumer environmental awareness to shape our research hypotheses.

2.1. *Express Delivery and Environmental Concerns*

There has been a rising trend towards utilizing express delivery, driven by factors such as heightened competition. As defined by Sage (2017), express delivery is characterized by the direct transportation of goods from suppliers to consumers under stipulated conditions, predominantly characterized by speed and enabled by tracking mechanisms. For the context of this research, express delivery is encapsulated as the distribution of goods within a 24-hour window.

In freight services, express delivery affords a notable competitive advantage, as articulated by Saha, Zhuang, and Li (2020). The authors examine whether consumers will pay more if delivery is efficient. The study shows that the main advantage of express delivery is that companies can differentiate themselves from their competitors. However, its intrinsic value in ensuring customer satisfaction remains ambiguous. Some consumers, as suggested by Brunetti, Russo, and Confente (2018), do not necessarily anticipate or judge a 24-hour delivery window necessary.

Express delivery comes with its set of opportunities and challenges. Research by Duan et al. (2019) indicates China's first-hand experience with traffic, safety, and pollution issues tied to express delivery. Rapid delivery demands exert enormous pressure on delivery personnel, potentially leading to risk-prone and less efficient driving

behaviors, as mentioned by Fan et al. (2017). The subsequent traffic congestion and environmental consequences further compound the problems associated with express delivery, as outlined by Duan et al. (2019). In addition, the inability to make optimal use of transport capacity plays an essential role in the problems caused by express delivery, according to Allen et al. (2018). In their empirical study of the impact of e-commerce on truck movements in densely populated areas, they concluded that the strict delivery times imposed by express delivery mean that journeys cannot be adequately combined to take advantage of optimal transport capacity. Indeed as highlighted by Rai et al. (2021), longer delivery times, combined with the lack of strict delivery time-frames, enable logistics service providers to optimize vehicle loading and routing, resulting in more efficient and sustainable deliveries.

2.2. *Eco-Delivery and Consumer Behavior*

To reconcile consumers' needs for speed and efficiency with growing environmental concerns, eco-delivery has emerged. Also known as environmentally friendly delivery within logistics and e-commerce, this delivery process prioritizes minimizing environmental impacts. This encompasses reducing greenhouse gas emissions, conserving natural resources, and curtailing pollution (Villa et al. 2023). Critical features of eco-delivery may include the use of low-emission vehicles, such as electric vehicles or vehicles using alternative fuels, optimization of delivery routes to minimize distances traveled, consolidation of shipments to maximize vehicle capacity, eco-friendly and recyclable packaging, and implementation of sustainable logistics practices throughout the supply chain (Boggio-Marzet, Villa-Martínez, and Monzón 2023).

According to Fraj and Martinez (2007), there is a discernible trend among consumers towards adopting ecologically responsible behaviors. Subsequently, organizations that fully integrate environmental sustainability into their marketing strategies tend to attract more consumers (Amir and Dhyani 2019). The emergent prominence of environmental consciousness in consumer purchasing decisions indicates a potential adaptive window for e-commerce providers. Specifically, as consumers gain cognizance of the societal repercussions of express delivery, e-commerce entities may have an augmented latitude to refine this service.

In accordance with the theory of planned behavior, as proposed by Ajzen (1991), it is established that consumer attitudes play a crucial role in shaping their behavioral intentions and subsequent actions. To clarify, a favorable attitude towards a particular behavior frequently results in a heightened inclination to participate in that behavior, while an adverse attitude can lead to avoidance or refusal.

Consumers with a strong concern for sustainability may feel discomfort when faced with the conflict between their preference for fast delivery and its negative environmental impact (Viet, de Leeuw, and van Herpen 2023). However, green strategies appear to have little influence on individuals who do not exhibit a positive attitude toward environmental issues. This indicates that sustainability motives alone are insufficient to increase acceptance of price surcharges for eco-friendly delivery options(Kokkinou et al. 2024). Additionally, Nogueira, de Assis Rangel, and Shimoda (2021) highlights a general lack of awareness about factors beyond the economic aspects of purchasing and transporting products. This can be attributed to limited consumer knowledge about how their choices impact the sustainability of product deliveries.

As a result, there is a plausible scenario where eco-aware consumers demonstrate a WTW longer for more environmentally friendly delivery. This may precipitate a shift among providers to reconsider the prevalent express delivery models. While the competitive advantage of express delivery is undeniable, and a segment of the consumer base may continue to prefer it, express delivery can also be considered an option instead of standard express. The supplier will, therefore, retain a competitive edge over its competitors for customers who require this express delivery. Additionally, it is worth noting that such customers are more likely to pay extra for this option (Brunetti, Russo, and Confente 2018).

2.3. *New Ecological Paradigm Scale*

The New Ecological Paradigm Scale (NEPS) offers a broad ecological framework consisting of five primary components: recognizing growth limitations, adopting an anti-anthropocentric perspective, understanding the fragile equilibrium of nature, rejecting human exceptionalism, and acknowledging the possibility of ecological crises (Gansser and Reich 2023).

The NEPS, introduced by Dunlap et al. (2000), is a revised version of an earlier scale by Dunlap and Liere (1978), designed to measure attitudes consistent with the new environmental paradigm. A higher score on this scale is associated with a stronger pro-environmental orientation, reflecting beliefs and attitudes aligned with ecological principles (Dunlap et al. 2000).

Despite its widespread use, the structure of the NEP scale remains a topic of debate. The original scale, developed by Dunlap and Van Liere (1978), proposed three core dimensions: (*i*) perceptions of humanity's impact on the natural balance, (*ii*) beliefs about the limits to societal growth, and (*iii*) attitudes toward humanity's dominion over nature. Initially composed of 12 items, the scale exhibited high internal consistency, with its dimensional validity supported by qualitative studies like Kempton, Boster, and Hartley (1995) interviews on Americans' environmental beliefs. However, researchers continue to debate whether the scale should be interpreted as unidimensional or multidimensional.

A review by Dunlap et al. (2000) summarized findings from factor analyses applied to the original scale. While some studies suggested all items aligned with a single factor, others identified two, three, or even four dimensions. To address these discrepancies, the revised NEP scale expanded to 15 items, incorporating six from the original, modifying four, and adding five new items. These were grouped into five theoretical dimensions: growth limitations, anti-anthropocentrism, nature's fragility, rejection of exceptionalism, and ecological crisis potential (Dunlap et al. 2000). Although factor analysis suggested four subscales, the authors advocated treating the 15 items as a unified measure due to their strong loadings on the first unrotated factor.

The revised NEPS includes 15 items targeting five aspects of an ecological worldview: growth limitations (items 1, 6, and 11), anti-anthropocentrism (items 2, 7, and 12), nature's fragility (items 3, 8, and 13), rejection of exceptionalism (items 4, 9, and 14), and ecological crisis potential (items 5, 10, and 15). The eight odd-numbered items reflect pro-ecological agreement, while the seven even-numbered items require disagreement to indicate ecological alignment (Dunlap et al. 2000).

2.4. *Hypotheses Development*

Based on the literature reviewed and the identified gaps, we formulate the following hypotheses:

- ***H1:*** *a high NEPS score is positively associated with a consumer's WTW for sustainable delivery.*

  The pressure on logistics service providers to reduce the delivery time increases emissions due to faster delivery, presenting a trade-off between competitiveness and environmental costs (Nogueira et al. 2022). Indeed, if customers are willing to wait longer for their delivery, companies could focus less on the speed of delivery and more on environmentally friendly delivery. Therefore, we can consider that the "willingness to wait" for environmentally friendly delivery might be higher among consumers who are considered more environmentally conscious.

- ***H2****: a high NEPS score is positively associated with a consumer's WTP for sustainable delivery.*

  The first hypothesis mentions that consumer environmental consciousness is a current trend (Amir and Dhyani 2019). To deliver in an environmentally friendly way, a provider can, on the one hand, implement longer delivery times to plan more efficient routes and limit emissions. However, this solution requires the customer to be willing to wait longer. There is, however, another solution that providers can use to deliver goods more ecologically. This solution involves investments to reduce the company's emissions (Sugiyama et al. 2012; Kumar and Alok 2020). Providers will need capital to implement these investments, so transport costs could also increase for the customer. Therefore, this hypothesis examines the effect of a consumer's degree of environmental consciousness on their willingness to pay for environmentally friendly delivery.

- ***H3****: a high NEPS score negatively correlates with a consumer's WTP for express delivery.*

  The literature shows that efficient delivery positively impacts customer satisfaction (Saha, Zhuang, and Li 2020). However, the importance of express delivery for the consumer is currently lacking in the literature. As mentioned earlier, this

mode of delivery can provide a competitive advantage to a courier service, as it can differentiate itself from competitors in the sector (Saha, Zhuang, and Li 2020). However, these papers do not explain whether the consumer desires fast delivery. This paper seeks to address this gap in the literature by examining whether the consumer is willing to pay more for express delivery. Therefore, it explores whether a consumer's degree of environmental consciousness impacts this willingness to pay for express delivery to determine the effect of increasing environmental awareness among consumers on their attitude toward express delivery. Moreover, as expressed by Viet, de Leeuw, and van Herpen (2023), the theory of cognitive dissonance argues that consumers have a strong tendency to minimize the occurrence of discomfort resulting from any inconsistency in their cognitions and behaviors, as a discrepancy between the preference for speedy delivery and the negative sustainability effects of this option.

3. Methodology

An online survey was carried out in the South of Belgium to understand the purchasing behavior of e-commerce consumers, particularly their willingness to pay and wait for sustainable or express delivery. The food sector was intentionally excluded from this study because we aimed to evaluate the willingness to wait, which could be conflicted by the perishability of food products. The survey also aimed to assess the participants' environmental sensitivity and its influence on their willingness to pay and wait for eco-friendly delivery options.

3.1. *Questionnaire*

The questionnaire, provided in the **??**, was organized into four sections, i.e. (*i*) the socio-economic profile of the respondent, (*ii*) their e-commerce habits, (*iii*) their delivery preferences, and (*iv*) their environmental sensitivity.

In terms of socio-economic profile, we gathered data on various aspects of the respondent's background, including gender, age, place of residence, proximity to stores, professional status, and income.

Regarding e-commerce habits, we delved into the respondents' online shopping behaviors, such as their online shopping frequency and monthly expenditures related to these purchases.

With respect to delivery preferences, respondents were presented with hypothetical delivery options to assess their preferences toward different types of deliveries. They were asked about their WTW for more environmental delivery, defined as sustainable delivery and their WTP for both sustainable and express deliveries, meaning delivery within 24 hours. The WTW and WTP were evaluated using Likert scales, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with only the extreme ends labeled.

Concerning environmental sensitivity, we gauged the respondent's awareness and concern towards environmental matters. Participants were first asked about their perspective on whether sustainable deliveries should replace traditional ones. Furthermore, they requested to complete the NEPS to determine their ecological score. As discussed earlier, the NEPS comprises 15 questions designed to measure five aspects of the ecological world-view. Eight odd-numbered questions are formulated so that agreement indicates support for an ecological perspective. In contrast, the seven even-numbered questions are formulated such that disagreement indicates a pro-ecological perspective Dunlap et al. (2000). Using these responses, we deduced each respondent's NEPS score (Equation 1). This score is obtained by combining the scores from the eight pro-ecological questions (odd-numbered) and the inverted values (6 minus the response) from the seven anti-ecological questions (even-numbered). The final NEPS score is then normalized to a range between 1 and 5 by dividing by the total number of questions.

$$NEPS = \frac{\sum_{i \in odd}^{15} Q_i + \sum_{i \in even}^{15} (6 - Q_i)}{15} \tag{1}$$

3.2. *Sample & Data-cleaning*

The survey was administered to a diverse group of consumers from January to February 2025. It was distributed online, primarily through social media, to reach various participants. Since the survey was conducted in the South of Belgium by the University of Liège, most respondents are from the province of Liège, given that the university

is located in this province. In addition to this online approach, a portion of the sample was recruited through snowball sampling. This method expanded the scope of the study by asking participants to recommend others from their social network, thus creating a snowball sampling effect.

Once the data was collected, we carried out a comprehensive data-cleaning process. Of the 387 participants, 299 complete and valid responses were retained for the final analysis. Responses were excluded for various reasons, including (*i*) incomplete questionnaires; (*ii*) invalid responses, such as online purchases reported by individuals under 16 years old; (*iii*) participants residing outside the target area in Belgium.

To evaluate the sufficiency of the sample (Equation 2), we proceeded with the calculation of the necessary sample size based on a population proportion of 50% (p) and a population size of 2,950,100 (Walloon individuals over 16 years old). Conversely, the confidence interval was set at 95% (Z-score corresponding to the desired confidence level) and a margin error at 5% (E). Therefore, the sufficient sample size is 385. Using the sample of 299 observations obtained after data cleaning, the margin of error is 5.67%.

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{E^2} \tag{2}$$

3.3. *Principal Component Analysis*

Principal Component Analysis (PCA) is a statistical technique used to reduce the dimensionality of datasets while retaining as much variance as possible. This method is utilized to uncover the underlying patterns in the NEPS survey responses. PCA aims to capture the greatest amount of variance within the data, where the first principal component captures the most variance, and each subsequent component accounts for progressively less variance (Schreiber 2021).

The Kaiser criterion was employed to determine the appropriate number of dimensions (components in PCA terminology) to retain. This criterion stipulates that only factors with eigenvalues exceeding one should be retained (Braeken and Van Assen 2017). The initial solution was then subjected to a varimax rotation. This method

seeks to simplify the loading structure by minimizing the number of variables with high loadings on each factor, thereby sharpening the contrast between the loading coefficients of different components. Varimax also preserves the orthogonality of the components, ensuring that the extracted dimensions remain uncorrelated (Shrestha 2021).

3.4. *Cronbach's alpha analysis*

Cronbach's alpha is widely used to assess summated rating scales' internal consistency or reliability. It is perhaps the most prevalent method for estimating the internal consistency of items within a scale. Alpha measures how well the responses to different items (NEPS questions) correlate with each other (Agbo 2010). In other words, α estimates the proportion of variance in the survey responses that is systematic or consistent. The general formula for calculating α is:

$$\alpha = \frac{N}{N-1}\left(\frac{\sigma_x^2 - \sum_{i=1}^{N} \sigma_{y_i}^2}{\sigma_x^2}\right) \tag{3}$$

$N =$ Number of survey items

$\sigma_x^2 =$ Variance of the observed total scores

$\sigma_{y_i}^2 =$ Variance of item i for observation y

3.5. *Linear regression models*

We further explore the influence of ecological sensitivity on consumer attitudes towards the two delivery types under study. We employed linear regression models (Hope 2020) to assess this relationship.

4. Results

In this section, we present the descriptive statistics for the socio-economic variables. We also provide the results of the PCA and Cronbach's alpha analysis to validate the

reliability and consistency of our measures. We then test our hypotheses related to the NEPS scores and their association with consumers' WTW and willingness to pay WTP for sustainable delivery, as well as their WTP for express delivery.

4.1. *Descriptive Statistics*

Table 1 summarizes the descriptive statistics for the socio-economic variables of our study sample. Factors under evaluation encompass age distribution, regional demographics (province of residence), frequency of online purchases, income brackets, current professional status, and the proximity of frequently visited stores to respondents' homes, that is, whether or not the most frequented merchants (supermarket, bakery, hairdresser, clothing store,...) are located within a walkable distance of respondents' homes.

The southern provinces of Belgium serve as the focal point for this case study. With a dataset comprising 299 observations, this study aims to delve into the demographic distribution within these provinces, emphasizing the notable presence of Liège, as previously highlighted. The dataset also highlights a significant representation of female respondents (68.23%) and a predominance of individuals aged 16-35 (61.54%).

Table 1. Descriptive Statistics for Socio-Economic Variables

Age Group	**16-35**		**36-65**		**66+**	
Gender	M	F	M	F	M	F
	53 - 17.73%	131 - 43.81%	36 - 12.04%	68 - 22.74%	6 - 2.01%	4 - 1.34%
	Walloon Brabant					
Province		**Brussels**	**Hainaut**	**Liège**	**Luxembourg**	**Namur**
	2 - 0.67%	3 - 1.00%	10 - 3.34%	255 - 85.28%	17 - 5.69%	12 - 4.01%
Frequency of	**< Once a year**	**≥ Once a year**	**≥ Once a month**	**≥ Once a week**		
Online Purchase	9 - 3.01%	119 - 39.80%	124 - 41.47%	47 - 15.72%		
Income	**0-3000 €**	**3000-5000 €**		**> 5000 €**	**Unanswered**	
	55 - 18.39%	109 - 36.45%		108 - 36.12%	27 - 9.03%	
Active	**Yes**			**No**		
	225 - 75.25%			74 - 24.75%		
Proximity to	**Yes**			**No**		
Stores	107 - 35.79%			192 - 64.21%		

The more in-depth analysis (Table 2) shows that the NEPS, which measures environmental sensitivity (1 = low sensitivity, 5 = high sensitivity), the average response is 3.85, reflecting a relatively high environmental sensitivity, with a slight variation in responses, as indicated by the standard deviation of 0.50. Regarding whether sustainable delivery should be considered the standard type of delivery, the average response reaches 4.28, indicating strong agreement. This suggests that consumers believe that sustainable delivery should become the norm without requiring additional costs.

Table 2. Descriptive statistics for ecological sensitivity

Variables	Min.	1st Qu.	Mean	S.d.	3rd Qu.	Max.
NEPS	2.40	3.53	3.85	0.50	4.20	4.93
The most environmentally friendly delivery should be the standard way of delivery.	1.00	4.00	4.28	1.03	5.00	5.00

However, Table 3 reveals different consumer attitudes toward delivery options. The willingness to wait for eco-friendly delivery services receives an average rating of 3.77, with a third quartile value reaching 5.00, suggesting that a considerable proportion of respondents are open to waiting for sustainable delivery methods. Although consumers appear to be environmentally sensitive and inclined to see sustainable delivery as the standard, when it comes to paying for eco-delivery, the mean response drops significantly to 2.50, indicating reluctance among consumers to bear additional costs for environmentally friendly options. The willingness to pay for express delivery is slightly higher at 2.81. Still, it remains below the scale's midpoint, demonstrating a moderate preference for faster delivery but not at a significant financial expense. These findings underscore that, while consumers generally support sustainable practices, they expect not to pay for this service.

Table 3. Descriptive statistics for consumer behavior regarding delivery options

Variables	min	1st Qu.	Mean	S.d.	3rd Qu.	Max.
Willingness to wait for Eco-delivery (WTW Eco)	1.00	3.00	3.77	1.24	5.00	5.00
Willingness to pay for Eco-delivery (WTP Eco)	1.00	1.00	2.50	1.26	3.00	5.00
Willingness to pay for Express delivery (WTP Express)	1.00	2.00	2.81	1.42	4.00	5.00

The correlation matrix (Table 4) provides valuable insights into consumer preferences regarding WTW and WTP for eco-friendly and express delivery options.

First, there is a moderate positive correlation (0.487, $p < 0.001$) between WTW Eco and WTP Eco, meaning that consumers who are willing to wait for an eco-friendly delivery are also more inclined to pay for such an option. This suggests that those who prioritize sustainability are generally consistent in their behavior, both in terms of waiting time and financial commitment.

On the other hand, WTW Eco and WTP Express show a weak negative correlation (-0.174, $p = 0.002$). This indicates that individuals who are willing to wait for eco-friendly delivery are slightly less likely to pay for express shipping. This result suggests the presence of two distinct consumer profiles: those who value sustainability and patience versus those who prioritize speed and convenience.

Finally, the correlation between WTP Eco and WTP Express is nearly zero (-0.071,

$p = 0.219$), meaning that the willingness to pay for eco-friendly delivery does not significantly influence the willingness to pay for express delivery. This suggests that these two delivery options answer separate consumer needs and that preferences for one do not necessarily impact the other.

Table 4. Pearson correlation Matrix for consumer behavior regarding delivery options

	WTW Eco	WTP Eco	WTP Express
WTW Eco	1.000	0.487 ***	-0.174 **
WTP Eco	0.487 ***	1.000	-0.071
WTP Express	-0.174 **	-0.071	1.000

4.2. *PCA Analysis*

Figure 1 presents the frequency distributions for the various items in the NEPS. Each item measures a specific environmental world-view or perspective. Given that we are basing ourselves on the NEPS questionnaire, the even-numbered questions are asked in the anti-ecological direction.

Analyzing the cumulative proportion of variance in Table 5, we observe that the first four components have an eigenvalue greater than one. Therefore, we have analyzed PC1 to PC4.

After processing the PCA, the data were subjected to a Varimax rotation (Table 6) to simplify and facilitate the interpretation of the extracted factors. The loadings of the variables on the four factors (RC1, RC2, RC3, and RC4) and the proportions of variance explained by these factors were examined to understand the underlying dimensions of the responses.

The four factors explain 50.5% of the total variance in the responses, indicating that they capture a significant portion of the response structure to the environmental questions posed. Through this analysis, we identify four main categories: human optimism and nature's resilience (RC1), negative impact and underestimation of environmental crises (RC2), natural limits and the fragility of the earth (RC3), and tension between

Table 5. Eigenvalue and Kaiser criterion

Component	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Eigenvalue	**3.90**	**1.84**	**1.28**	**1.11**	0.99	0.92	0.78	0.74
Component	PC9	PC10	PC11	PC12	PC13	PC14	PC15	
Eigenvalue	0.70	0.61	0.60	0.55	0.51	0.41	0.33	
Kaiser Criterion	= 4							

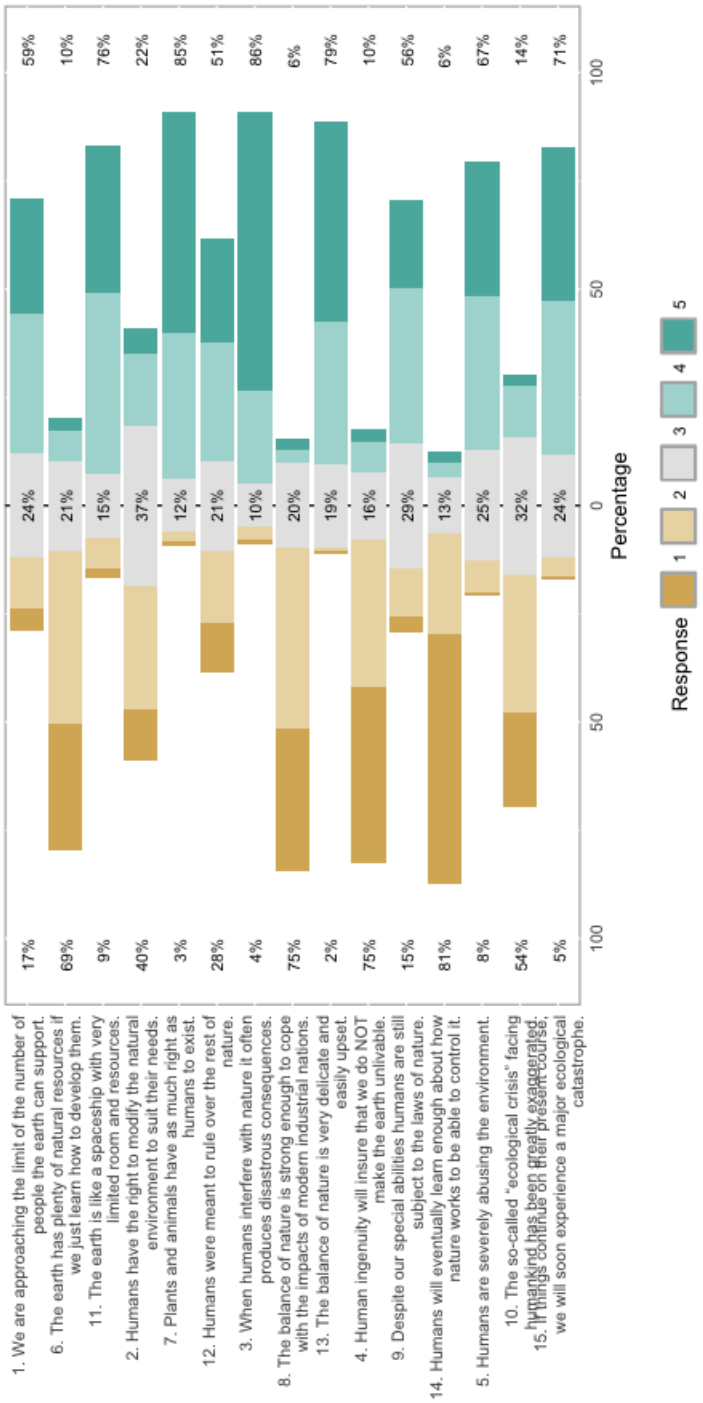

Figure 1. Frequency distributions for New Ecological Paradigm Scale Items (N = 299)

Table 6. Principal Component Analysis: Varimax method

Categories	Questions	Loadings RC1	RC2	RC3	RC4
Growth limitations (GL)	1. We are approaching the limit of the number of people the Earth can support.	-0.155	0.246	**0.569**	
	6. The Earth has plenty of natural resources if we just learn how to develop them.	**0.687**	0.112		0.121
	11. The Earth is like a spaceship with very limited room and resources.	-0.227		**0.695**	0.158
Anti-anthropocentrism (AA)	2. Humans have the right to modify the natural environment to suit their needs.	0.355		-0.140	**-0.614**
	7. Plants and animals have as much right as humans to exist.	0.196	0.346		**0.624**
	12. Humans were meant to rule over the rest of nature.	0.402	**-0.432**	0.101	-0.322
Nature balance (NB)	3. When humans interfere with nature, it often produces disastrous consequences.	-0.120		0.195	**0.728**
	8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	**0.487**	-0.230	-0.456	
	13. The balance of nature is very delicate and easily upset.	0.169		**0.716**	0.194
Exceptionalism (E)	4. Human ingenuity will ensure that we do NOT make the Earth unlivable.	**0.585**	-0.100	-0.147	-0.161
	9. Despite our special abilities, humans are still subject to the laws of nature.		**0.482**		
	14. Humans will eventually learn enough about how nature works to be able to control it.	**0.617**	-0.182		-0.333
Ecological crisis (EC)	5. Humans are severely abusing the environment.		**0.610**	0.228	0.359
	10. The so−called ...ecological crisis... facing humankind has been greatly exaggerated.	0.408	**-0.673**		
	15. If things continue on their present course, we will soon experience a major ecological catastrophe.	-0.181	**0.619**	0.334	0.166
Standard Deviation loadings		2.081	1.928	1.791	1.774
Proportion of Variance		0.139	0.129	0.119	0.118
Cumulative Proportion		0.139	0.267	0.387	0.505

human dominion and respect for nature (RC4).

4.3. *Cronbach's alpha analysis*

The analysis indicates that the NEPS scale is reliable. The Cronbach's Alpha value for the scale is 0.78, which indicates a good level of internal consistency. Typically, a Cronbach's Alpha value of 0.7 or higher suggests that the items in the scale are sufficiently correlated and measure the same underlying construct, in this case, environmental sensitivity or attitudes towards environmental issues.

In Table 7, each item has a Cronbach's Alpha very similar to the overall Cronbach's Alpha (0.76 to 0.79), indicating that none of the individual items significantly reduce the internal consistency of the scale. The item with the highest reliability when dropped is item 6, which has a reliability of 0.79. However, its removal does not drastically alter Cronbach's Alpha, reinforcing that the scale is stable and reliable even if one item is omitted.

As the scale demonstrates strong reliability and good balance between the items, summing the item scores is a valid approach to derive a summed scale. This enables the calculation of a total score for each participant, effectively capturing their overall position on the dimensions measured by the NEPS.

Table 7. Cronbach's Alpha

Cronbach's Alpha	**0.78**
Reliability if an item is dropped:	
1. We are approaching the limit of the number of people the Earth can support.	0.77
2. Humans have the right to modify the natural environment to suit their needs.	0.76
3. When humans interfere with nature, it often produces disastrous consequences.	0.77
4. Human ingenuity will ensure that we do NOT make the Earth unlivable.	0.76
5. Humans are severely abusing the environment.	0.76
6. The Earth has plenty of natural resources if we just learn how to develop them.	0.79
7. Plants and animals have as much right as humans to exist.	0.77
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	0.76
9. Despite our special abilities, humans are still subject to the laws of nature.	0.78
10. The so−called ...ecological crisis... facing humankind has been greatly exaggerated.	0.76
11. The Earth is like a spaceship with very limited room and resources.	0.76
12. Humans were meant to rule over the rest of nature.	0.76
13. The balance of nature is very delicate and easily upset.	0.77
14. Humans will eventually learn enough about how nature works to be able to control it.	0.75
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	0.75

4.4. *Hypothesis Testing*

4.4.1. H1: A high NEPS score is positively associated with a consumer's WTW for sustainable delivery

Results presented in Table 8 show that the NEPS score (0.781) positively impacts the WTW for sustainable delivery. Our sample supports H1 ($p < 0.001$), indicating strong statistical significance. In other words, there is robust evidence to suggest that the NEPS variable has a significant and positive impact on the willingness to wait for eco-friendly delivery.

Examining the regression analysis based on the PCA results, we observe that human optimism and nature's resilience (RC1) is negatively and significantly associated with willingness to wait for eco-friendly delivery ($\beta = -0.176, p = 0.049$), indicating that individuals who are optimistic about human innovation and nature's ability to recover are less likely to wait for sustainable shipping options.

In contrast, the belief in the negative impact of human activities (RC2) has a positive but not significant effect ($\beta = 0.232, p = 0.189$), suggesting a minor influence that does not significantly affect decision-making regarding eco-friendly delivery.

However, recognizing Earth's natural limits and fragility (RC3) has a positive and

statistically significant relationship with the willingness to wait for eco-delivery ($\beta = 0.238, p = 0.016$), emphasizing that awareness of Earth's fragility encourages people to be more patient with sustainable options.

Finally, the tension between human dominion and respect for nature (RC4) has a non-significant and negative effect ($\beta = -0.183, p = 0.362$), suggesting that this perspective does not significantly influence the willingness of people to opt for eco-friendly delivery.

The analysis highlights that the belief in human ingenuity and nature's resilience reduces the willingness to wait for eco-friendly delivery, while understanding the Earth's fragility increases it. However, perceptions of human impact and the tension between dominion and respect for nature do not appear to have a meaningful effect.

Table 8. Linear regression model: Willingness to Wait for Eco-delivery (H1)

$WTW_{ECO} = \beta_0 + \beta_1 NEPS$			Multiple R-squared: 0.098 Adjusted R-squared: 0.095	
Parameter	**Estimate**	**Std. Error**	***t*-value**	***p*-value**
(Intercept)	0.762	0.533	1.428	0.154
NEPS	0.781	0.137	5.680	<0.001 ***
Additional Analysis :				
$WTW_{ECO} = \beta_0 + \beta_1 RC1 + \beta_2 RC2 + \beta_3 RC3 + \beta_4 RC4$			Multiple R-squared: 0.057 Adjusted R-squared: 0.044	
Parameter	**Estimate**	**Std. Error**	***t*-value**	***p*-value**
(Intercept)	3.028	0.801	3.781	<0.001 ***
RC1	-0.176	0.089	-1.976	0.049 *
RC2	0.232	0.176	1.316	0.189
RC3	0.238	0.10	2.420	0.016 *
RC4	-0.18	0.29	-0.912	0.362

4.4.2. H2: A high NEPS score is positively associated with a consumer's WTP for sustainable delivery

Results presented in Table 9 show that the NEPS score positively impacts the WTP (0.693) for sustainable delivery. Our sample supports H2. The p-value is <0.001, indicating strong statistical significance. In other words, there is robust evidence to suggest that the NEPS variable has a significant and positive impact on the WTP for eco-friendly delivery.

The second regression results indicate that human optimism and nature's resilience (RC1) is negatively and significantly associated with the willingness to pay for eco-friendly delivery ($\beta = -0.194, p = 0.034$). This suggests that people who trust human ingenuity and nature's capacity to recover are less likely to spend more on sustainable

shipping options.

Conversely, the belief in the negative impact of human activities (RC2) has a positive and significant effect ($\beta = 0.356, p = 0.048$), implying that those who acknowledge environmental degradation tend to be more willing to support eco-friendly delivery.

Although recognizing Earth's natural limits and fragility (RC3) also shows a positive relationship, the effect remains statistically non-significant ($\beta = 0.161, p = 0.110$), suggesting a weaker influence on decision-making.

As for the tension between human dominion and respect for nature (RC4), its impact on willingness to pay for eco-friendly delivery is negligible and non-significant ($\beta = 0.009, p = 0.964$), indicating that this perspective does not play a major role.

In summary, those who believe in the ability of human ingenuity to handle environmental issues appear less inclined to pay for eco-friendly delivery. In contrast, those who recognize human-caused environmental harm are likelier to do so. However, perceptions of Earth's fragility and the debate between human dominance and nature's rights do not seem to have a decisive influence.

Table 9. Simple linear regression model: Willingness to Pay for Eco-delivery (H2)

$WTP_{ECO} = \beta_0 + \beta_1 NEPS$			Multiple R-squared: 0.074 Adjusted R-squared: 0.071	
Parameter	**Estimate**	**Std. Error**	***t*-value**	***p*-value**
(Intercept)	-0.170	0.550	-0.309	0.757
NEPS	0.693	0.142	4.889	<0.001 ***
Additional Analysis :				
$WTP_{ECO} = \beta_0 + \beta_1 RC1 + \beta_2 RC2 + \beta_3 RC3 + \beta_4 RC4$			Multiple R-squared: 0.053 Adjusted R-squared: 0.041	
Parameter	**Estimate**	**Std. Error**	***t*-value**	***p*-value**
(Intercept)	1.137	0.817	1.391	0.165
RC1	-0.194	0.091	-2.131	0.034 *
RC2	0.356	0.180	1.982	0.048 *
RC3	0.161	0.100	1.601	0.110
RC4	0.009	0.205	0.045	0.964

4.4.3. H3: A high NEPS score negatively correlates with a consumer's WTP for express delivery

The regression results (Table 10) indicate that the NEPS score has a negative (-0.416) and significant (p-value = 0.0122) impact on WTP for express delivery. There is statistical evidence to suggest that the NEPS variable significantly impacts the willingness to pay for express delivery, although the effect size is modest.

The results of the additional regression analysis concerning the willingness to pay for

express delivery reveal some noteworthy relationships. Human optimism and nature's resilience (RC1) is found to have a positive and statistically significant impact ($\beta = 0.291, p = 0.005$), suggesting that people who hold a more optimistic view of human innovation and nature's resilience are more inclined to pay for express delivery.

Meanwhile, the belief in the negative impact of human activities (RC2) shows a negative, yet non-significant effect ($\beta = -0.277, p = 0.178$), meaning that those who acknowledge the negative consequences of human actions on the environment might be less likely to pay for express delivery, but this relationship is not statistically significant.

When considering Earth's natural limits and fragility (RC3) and the tension between human dominion and respect for nature (RC4), the effects are negligible and non-significant ($\beta = 0.004, p = 0.710$ and $\beta = 0.234, p = 0.317$, respectively), indicating that these perspectives have minimal influence on willingness to pay for express delivery.

These findings highlight that the belief in human optimism and nature's resilience increases willingness to pay for express delivery, while perceptions of human impact, Earth's fragility, and the debate between dominion and respect for nature do not appear to have a strong influence on this decision.

Table 10. Simple linear regression model: Willingness to Pay for Express delivery (H3)

$WTP_{EXPRESS} = \beta_0 + \beta_1 NEPS$			Multiple R-squared: 0.021 Adjusted R-squared: 0.018	
	Coefficients:			
	Estimate	Std. Error	t value	$Pr(>\|t\|)$
(Intercept)	4.406	0.640	6.884	<0.001 ***
NEPS	-0.416	0.165	-2.521	0.012 *
Additional Analysis :				
$WTP_{EXPRESS} = \beta_0 + \beta_1 RC1 + \beta_2 RC2 + \beta_3 RC3 + \beta_4 RC4$			Multiple R-squared: 0.037 Adjusted R-squared: 0.024	
Parameter	**Estimate**	**Std. Error**	***t*-value**	***p*-value**
(Intercept)	2.206	0.932	2.367	0.019 *
RC1	0.291	0.104	2.807	0.005 **
RC2	-0.277	0.205	-1.350	0.178
RC3	0.043	0.115	0.372	0.710
RC4	0.234	0.234	1.002	0.317

5. Discussion

Our PCA analysis emphasizes a four-dimensional approach to understanding environmental attitudes, by attempting to decompose the environmental beliefs into influential components, each addressing different aspects of attitudes, providing a more detailed

and nuanced perspective. While Fraj and Martinez (2007) propose a three-dimensional approach, to understanding environmental attitudes, addressing emotional, cognitive, and conative components, and present a broad view of how consumers feel and act concerning ecological products, our study provides a detailed insight into how specific environmental beliefs shape consumer preferences in delivery options. This environmental sensitivity is evident in their willingness to adapt their delivery preferences to support environmentally friendly practices in the e-commerce sector. Indeed, consumers are willing to wait for sustainable delivery, suggesting a general acceptance of the idea that longer delivery times may be necessary to reduce environmental impact.

While consumers express a readiness to pay more for sustainable or express deliveries, the average response indicates a reluctance to bear these costs. This highlights a disparity between consumers' environmental convictions and their financial commitments in e-commerce. This is directly linked to Nogueira, de Assis Rangel, and Shimoda (2021)'s findings, which suggest that while e-consumers are increasingly exposed to making sustainable choices, the environmental aspect of deliveries remains the least important factor for them during an online purchase. The economic dimension remains the priority during the purchasing process. In the Chinese context, Shen and Wang (2022) similarly emphasizes the complex interplay between pro-environmental attitudes and various influencing factors, including perceived costs and cultural determinants. The gap between a positive attitude toward sustainable products and actual purchasing behavior is also underscored by Park and Lin (2020) within the recycled and upcycled fashion commodities domain. A comprehensive literature review on sustainable consumption by Haffar, Durif, and Dubé (2020) reveals an evident green gap between consumers' eco-friendly sentiments and their real-world actions.

Caspersen, Navrud, and Bengtsson (2022) investigated the WTP for climate-friendly last-mile deliveries. Their discrete choice experiment revealed that females are willing to pay for CO_2 mitigation, with WTP increasing with income, employment, willingness to change habits, and preferences for sustainable online shopping and delivery alternatives. However, WTP decreases with the frequency of online shopping. This suggests that while consumers are environmentally conscious, their financial commitment to these practices varies significantly based on their shopping habits and socioeconomic

status.

However, in our research, the lack of significance of socio-demographic variables currently hinders the ability to develop targeted awareness campaigns based on these variables. This discrepancy might be attributed to the differing methodologies and contexts of the studies. While Caspersen, Navrud, and Bengtsson (2022) focus on specific demographic groups and their detailed characteristics, our broader approach reveals that socio-demographic factors do not significantly influence the general population's WTP for sustainable delivery options. As a result, it is more effective to implement general awareness campaigns that address the broader population.

Contrary to the findings of Ignat and Chankov (2020), which indicate that participants are willing to wait longer, pay more, or opt for a less convenient location in exchange for a more environmentally sustainable delivery, our results reveal a disparity in perception between the WTW and the WTP. While consumers are willing to wait for eco-friendly delivery, they do not seem willing to pay for this option. The average responses show that consumers are more inclined to pay for express delivery than for sustainable delivery. Our results are aligned with those of Villa et al. (2023), showing that consumers are initially willing to adopt sustainable measures in e-commerce delivery. Still, the most important factors are speed and free pick-up ahead of green delivery. This insight prompts an examination of consumer values and choices regarding eco-friendly initiatives and the ability of e-commerce organizations to successfully endorse sustainable practices while adapting to consumers' changing needs and desires. As exposed by Kokkinou et al. (2024), sustainability motives are not sufficient to increase the acceptance of price surcharges.

Looking at consumer preferences, we find that when consumers are faced with a financial contribution for either delivery option, they tend to favor the less environmentally friendly solution that provides them with more immediate personal satisfaction, namely express delivery. This preference for express delivery, even if it is less environmentally friendly, suggests that consumers place great importance on the speed and convenience of delivery. They are willing to make a financial effort if it results in direct personal satisfaction, but they hesitate to pay more for sustainable practices that do not have an immediate impact on their shopping experience. This confirms Brunetti,

Russo, and Confente (2018)'s statement that express delivery can be considered an option.

Our regression analysis provides valuable insights into the relationship between environmental sensitivity, as measured by the NEPS score, and consumer attitudes toward different delivery options. The positive impact of NEPS on the WTW and WTP for sustainable delivery highlights the role of environmental awareness in shaping consumer preferences for eco-friendly practices in e-commerce. Additionally, the negative impact on the WTP for express delivery underscores the complex interplay of consumer values and choices in the context of environmental concerns. These findings align with Han, Chua, and Hyun (2020) research on eco-friendly electric airplanes, which identifies factors motivating sustainable purchases, such as perceived uncertainty of outcomes and attachment to eco-friendly products. Our research contributes to a deeper understanding of the factors influencing consumer behavior in the e-commerce sector and has implications for businesses seeking to align their practices with evolving consumer values.

This observation underscores the importance of striking a balance between promoting environmental sustainability and meeting consumers' evolving expectations and preferences in the e-commerce sector. Companies must consider these dynamics when developing effective strategies that address changing consumer expectations regarding sustainability.

6. Conclusion

Regarding our linear regressions, NEPS is positively and highly significant for Willingness to Wait and Willingness to Pay for Eco delivery. This suggests that NEPS strongly influences consumers' preferences for sustainable delivery options, reinforcing the assumption that individuals with higher environmental sensitivity are more inclined to wait longer and pay more for eco-friendly shipping.

However, NEPS is only negatively and weakly significant for Willingness to Pay for Express delivery. This could imply that the factors driving the demand for express shipping are different and less related to environmental sensitivity, possibly being

more influenced by urgency, convenience, or situational constraints than environmental considerations.

The PCA analysis highlights four major categories of questions within the NEPS analysis. The factor RC1 suggests that loadings focus on the belief that humans can solve environmental problems through their ingenuity and their growing understanding of nature. It also suggests that nature is resilient enough to adapt and recover from human impacts. Human actions will eventually lead to better control over the environment. Therefore, RC1 emphasizes human optimism and the resilience of nature. RC1 has a significant impact across all tested linear regressions.

The factor RC2 made up of variables in this category that acknowledge the negative impact of human activity on the environment (abuse, degradation), but sometimes underestimate the scale of environmental crises. They oscillate between recognizing environmental dangers and minimizing their urgency, suggesting that crises are exaggerated or that humans can dominate nature without serious consequences. RC2 has a significant impact on the willingness to pay for ecological delivery.

Then factor RC3 discusses the idea that Earth has strict limits in terms of population, resources, and ecological balance. It emphasizes the fragility of nature and the importance of not exceeding these limits, as any disruption could have serious consequences. The idea of Earth as a closed system reinforces the vision of natural limits to respect. RC3 has a significant impact on the willingness to wait for ecological delivery.

Finally, the last component seems to show a duality: on one side, the idea that humans have the right to modify the environment to meet their needs, and on the other, the recognition of the negative consequences of such interference. They also highlight an ethical perspective advocating for the respect of the rights of other life forms (animals, plants), suggesting a need to balance human exploitation with respect for nature. RC4 was found to be not significant in any of the regressions tested. This suggests that there is no meaningful impact on the dependent variables in the models, indicating that it may not be a relevant factor in explaining consumers' willingness to wait or pay for different delivery options.

In conclusion, principal component analysis with Varimax rotation reveals four main dimensions of environmental attitudes: human optimism and nature's resilience, nega-

tive impact and underestimation of environmental crises, nature limits and the fragility of Earth and tension between human domination and respect for nature. These dimensions provide a framework for understanding the different perspectives and concerns of individuals in relation to the environment.

Moreover, our research sheds light on consumers' e-commerce delivery preferences, revealing a dichotomy between their environmental inclinations and actual choices. Notably, consumers appear environmentally attuned, showing willingness for longer delivery times if it is eco-friendly. This challenges the race in the e-commerce domain for faster delivery, a competitive edge that may not be a direct consumer demand. Yet, when finances come into play, they lean towards express deliveries, prioritizing immediate gratification over environmental impact. This mirrors the "Not in my backyard (NIMBY)" syndrome, wherein individuals are averse to personal inconveniences for larger benefits. The findings suggest that while consumers lean towards eco-friendly delivery, cost impediments deter them.

7. Future research and limitations

As e-commerce businesses emphasize sustainability in their branding, future research should explore strategies for integrating green practices without compromising perceived delivery speed and cost.

Subsequent research could be enriched by diversifying the demographic pool and probing deeper into order specifics. Additionally, incorporating variables such as purchase value and marketing tactics could provide a more comprehensive understanding of consumer decisions. This would grant e-commerce entities a clearer perspective of consumer demands, aiding in refining their operational strategies.

Our study offers insights for upcoming research aiming to enhance e-commerce delivery sustainability from the consumer's viewpoint, suggesting that our approach could inform further studies on realizing eco-friendly measures aligned with e-commerce users' attitudes. Delving into packaging alternatives could also improve sustainable e-commerce practices.

Future research should explore several additional dimensions to deepen the under-

standing of sustainable delivery practices. Specifically, examining the role of consumer education and awareness campaigns in shaping attitudes towards sustainable delivery is of paramount importance. By assessing the level of consumer knowledge regarding sustainability, targeted campaigns can be formulated to effectively highlight the benefits of sustainable delivery options.

Exploring the impact of technological advancements, such as AI-driven logistics and supply chain transparency, on sustainable delivery practices could provide insights into how these innovations can streamline operations and reduce environmental impact. These advancements have the potential to make sustainable practices more efficient and cost-effective.

Moreover, the influence of government policies and regulations on e-commerce sustainability could be examined. Government can create a framework that encourages businesses to adopt greener practices through incentives, regulations, and standards. Therefore, analyzing the economic impact of implementing sustainable delivery practices on e-commerce businesses will help understand the financial implications and benefits. This includes evaluating the cost-benefit ratio and long-term economic advantages of sustainable practices.

Finally, it is vital to investigate the role of collaboration across the supply chain in achieving sustainability goals. Collaboration among different stakeholders, including suppliers, manufacturers, and logistics providers, can lead to more comprehensive and effective sustainability strategies.

By addressing these areas, future research can provide a comprehensive understanding of the various factors influencing sustainable delivery practices and guide businesses and policy makers to foster a more sustainable e-commerce ecosystem.

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Disclosure statements

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

The data are not publicly available because they contain information that could compromise the privacy of research participants.

Ethics

Our research strictly adheres to the General Data Protection Regulation (GDPR), ensuring all participant data is processed lawfully, transparently, and securely. We have implemented robust mechanisms to protect data integrity and confidentiality, thus upholding our ethical responsibility to protect participants' information.

Informed Consent

Informed consent was obtained from all participants involved in this study. Participants were provided with a detailed consent form prior to their participation, which outlined the purpose of the study, the nature of the data collection, their rights as participants, and the confidentiality measures in place. The form clearly stated that participation was voluntary, and participants could withdraw at any time without penalty. Consent was recorded electronically; participants indicated their agreement by clicking on the "I agree" button after reading the consent form.

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Appendix A.

Q1 - What is your age? (in numbers)

Q2 - What is your gender?

☐ Male (1)

☐ Female (2)

☐ X (3)

Q3 - In which municipality do you live?

Postal code (1):

Municipality (2):

Q4 - Are your most visited merchants (supermarket, bakery, hairdresser, clothing store, etc.) within walking distance of your home?

☐ Yes (1)

☐ No (2)

Q5 - Are you currently employed as a main occupation?

☐ Yes (1)

☐ No (2)

Q6 - What is the average total net income of your household?

(By family, we mean all persons living at the address where you actually reside)

☐ 0 - 1,500 € per month (1)

☐ 1,501 - 2,000 € per month (2)

☐ 2,001 - 3,000 € per month (3)

☐ 3,001 - 4,000 € per month (4)

☐ 4,001 – 5,000 € per month (5)

☐ More than 5,000 € per month (6)

☐ I prefer not to answer this question (7)

Q7 - How often do you buy products online?

(Please exclude food suppliers when answering this question.)

☐ Almost never (1)

☐ At least once a year (2)

☐ At least once a quarter (2)

☐ At least once a month (3)

☐ At least once a week (4)

☐ Several times a week (5)

☐ Daily (6)

For the purposes of this study, we define sustainable deliveries as environmentally-friendly deliveries designed to minimize greenhouse gas emissions. Express deliveries will be defined as delivery processes in less than 24 hours.

Q8 - Indicate to what extent you agree or disagree with the following statements (Please exclude food suppliers when answering this question.):

Statement	**Completely disagree (1)**	**(2)**	**(3)**	**(4)**	**Completely agree (5)**
I am willing to wait longer for my delivery if the delivery would be more environmentally friendly. (1)	☐	☐	☐	☐	☐
I am willing to pay more for my delivery if the delivery would be more environmentally friendly. (2)	☐	☐	☐	☐	☐
I am willing to pay more for my delivery if my order is delivered within 24 hours. (3)	☐	☐	☐	☐	☐

Q9 - Indicate to what extent you agree or disagree with the following statements (Please exclude food suppliers when answering this question.):

Statement	**Completely disagree (1)**	**(2)**	**(3)**	**(4)**	**Completely agree (5)**
The most environmentally friendly delivery should be the standard way of delivery. (1)	☐	☐	☐	☐	☐

Q10 - Indicate to what extent you agree or disagree with the following statements:

Statement	**Completely disagree (1)**	**(2)**	**(3)**	**(4)**	**Completely agree (5)**
1. We are approaching the limit of the number of people the Earth can sustain.	☐	☐	☐	☐	☐
2. People have the right to adapt nature to their needs.	☐	☐	☐	☐	☐
3. When humans interfere with nature, it often has disastrous consequences.	☐	☐	☐	☐	☐
4. Human ingenuity will ensure that we do not make the Earth uninhabitable.	☐	☐	☐	☐	☐
5. Humanity seriously abuses the environment.	☐	☐	☐	☐	☐
6. The Earth has enough natural resources if we just learn how to develop them.	☐	☐	☐	☐	☐
7. Plants and animals have the same right to existence as humans.	☐	☐	☐	☐	☐
8. The balance in nature is strong enough to absorb the consequences of modern industrial nations.	☐	☐	☐	☐	☐

9. Despite our special abilities, humans are still subject to the laws of nature.	☐	☐	☐	☐	☐
10. The so-called "ecological crisis" that humanity faces is greatly exaggerated.	☐	☐	☐	☐	☐
11. The Earth is like a spaceship, with very limited space and resources.	☐	☐	☐	☐	☐
12. Humans were destined to rule over the rest of nature.	☐	☐	☐	☐	☐
13. The balance in nature is very delicate and easily disturbed.	☐	☐	☐	☐	☐
14. Ultimately, humans will learn enough about how nature works to be able to control it.	☐	☐	☐	☐	☐
15. If things continue on their current course, we will soon experience a major ecological catastrophe.	☐	☐	☐	☐	☐